MOA Number: FNA/09-02-01 Effective Date: June 20, 2002

MEMORANDUM OF AGREEMENT
between
DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION
AND
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
concerning
AIRCRAFT NOISE REDUCTION TECHNOLOGY

1. PURPOSE

The Federal Aviation Administration (FAA) and the National Aeronautics and Space Administration (NASA) are committed to a close partnership in the pursuit of complementary goals in aviation and future space transportation. These goals include aviation safety, airspace system efficiency, environmental compatibility, and others. It has been agreed that in order to facilitate this partnership, the agencies will coordinate their planning efforts, and senior management will monitor the collaborative activities necessary to accomplish these goals.

The purpose of this Memorandum of Agreement (MOA) is to build upon and expand the long-standing relationship between the FAA and NASA with respect to environmental compatibility. Specifically, this MOA aims to form the basis upon which the FAA and NASA may establish programs and plans to achieve the joint long-term national goal of containing objectionable aircraft noise within airport and compatible land use boundaries. This MOA is written in accordance with the guidelines established by FAA/NASA Memorandum of Understanding (MOU), FNA 09 concerning Aviation Environmental Compatibility, dated October 6, 2000.

2. BACKGROUND

Aircraft noise continues to be a persistent domestic and international concern, and has prompted some airport operators to impose noise budgets, curfews, and other access restrictions. Currently, over 600 airports worldwide have noise-related restrictions. Noise issues are restricting civil aviation growth by delaying and inhibiting expansion of much needed airport capabilities. In the absence of continued airplane source noise reduction, noise impact will increase due to projected increases in air traffic, thereby imposing fundamental limits on air transportation in the 21st century as well as being an economic factor in industrial competition.

In February 1992, the FAA and NASA initiated a cosponsored, multiyear program focused on achieving significant noise reduction technology advances. In October 1992, Congress mandated that the FAA and NASA jointly conduct an aircraft noise reduction research program, the goal of which is to develop technologies to enable subsonic jet aircraft to operate at reduced noise levels (Section 304 of the Airport and Airway Safety, Capacity, Noise Improvement, and

Inter-modal Transportation Act of 1992, P.L. 102-581, 106 Stat. 4896). That same year, NASA initiated the Advanced Subsonic Technology (AST) Program--a broad aeronautical technology development program with the goal of developing high payoff technologies to enable a safe, highly productive, global air transportation system that includes a new generation of environmentally compatible, economical U.S. subsonic aircraft. The noise reduction element of this program, which began in Fiscal Year (FY) 1994, was NASA's primary contribution to the joint FAA-NASA Subsonic Noise Reduction Technology Program. Although the AST Program was terminated in FY 1999, the noise reduction element was transferred to the Aerospace Research and Technology (R&T) Base Vehicles Systems Technology Program. The noise reduction program concluded as planned in FY 2001.

By the end of FY 2000, NASA developed a suite of technologies that achieved all of the component technical objectives based on empirical testing, such as high fidelity model-scale wind tunnel tests and limited full-scale engine static tests. System assessment indicated that the program minimum success criterion of a seven decibel community noise impact reduction relative to 1992 production technology was achieved for the three baseline commercial transport airplane classes. The agencies agreed that to achieve the long-term national goal of containing objectionable aircraft noise within airport and compatible land use boundaries would require additional research beyond FY 2001. NASA's Quiet Aircraft Technology (QAT) program, initiated in FY 2001, addresses these additional research requirements.

Research performed under this MOA will be directed at developing technology that, when implemented, will improve the quality of life of our citizens by reducing their noise exposure from our country's air transportation system. Technologies will be targeted for application to current and future commercial subsonic jet transports. Developed technologies will reduce the technical risks associated with NASA's QAT program by developing a larger suite of technologies to achieve the technical goals. Where possible, technology development will go beyond that in the QAT program to further mature the most promising technology to increase the confidence in its projected noise impact benefit. Increased confidence in technical benefit accelerates implementation into a product, and ultimately the realization of less community noise impact for our citizens.

3. SCOPE/OBJECTIVE

The FAA and NASA will focus their efforts on defining tasks to meet the overall goals/objectives of this MOA, and on ensuring a coordinated series of activities that will lead to the success of the QAT Program. The scope of the FAA/NASA program encompasses the development of noise reduction technologies for derivatives of today's subsonic jet aircraft, as well as for future configurations powered by higher bypass ratio jet engines. The long-term aim is to develop technology to reduce the levels of future subsonic jet aircraft by 20 decibels relative to the 1997 state-of-the-art technology. The degree of noise reduction technology that can be incorporated into a particular airplane will vary depending on the specific model and engine type.

Together, the FAA and NASA will co-lead the development of a broad based research effort embracing the following provisions:

- Focused funding on promising technologies;
- Expanded research opportunities for U.S. industry partners;
- Increased cooperation with international research programs; and
- Annual progress/success assessments.

4. STATEMENT OF WORK

The FAA and NASA will define tasks to meet the overall goals/objectives of this MOA to ensure a coordinated series of activities that will improve the quality of life in residential communities around commercial airports through the application of technologies to mitigate aircraft noise impact. An individual Statement of Work (SOW) for the activities outlined below will, at a minimum, include: agreements for temporary detail of personnel between agencies when necessary; use of major facilities, including appropriate test facilities; funding approaches and authorization, including transferring of funds between agencies; and, mechanisms for working with contractor teams. Detailed deliverables will be outlined in the SOW to include all resources (i.e., personnel, annual funding).

A. ACTIVITIES

The FAA and NASA will perform the activities listed below. These activities will include, but not be limited to: concept definitions, component requirements, component/systems assessments, validation testing, and flight tests.

1. Propulsion System Source Reduction. NASA and industry will develop technologies to reduce aircraft noise at the source. The basis of discovery of successful noise reduction concepts is the fundamental understanding of the physics of the source mechanisms. Research under this activity will include improving the state-of-the-art understanding of engine system fan and jet source mechanisms. This knowledge will be used to discover, develop, and validate fan and jet noise reduction concepts for current and future propulsion systems. In addition, the role of core noise as a contributor to community noise impact will be assessed.

2. Aircraft System Source Noise Reduction. NASA and industry will develop technologies to diminish airframe-related noise. Due to past success in reducing engine noise over the last 40 years, airframe noise has become a dominant source of community noise impact for modern transports during landing and in the future will be a contributor to community noise impact during takeoff. As with engine noise reduction, the key to success in airframe noise reduction is understanding the physics of noise generation. Research under this task will include improvements to source mechanism understanding that then will be used to discover, develop, and validate airplane high-lift system and landing gear noise reduction concepts. The not very well understood role of engine and airframe source noise shielding and reflection from the airplane structure will be investigated for

conventional airplane configurations. The goal of this effort is to optimize at the aircraft system level for low community noise impact.

3. Operational Noise Reduction. The FAA, NASA and industry will develop and evaluate advanced aircraft operating procedures, including steeper glide-slopes and precision, wind-compensated flight paths. Modern navigation capabilities coupled with modern flight management systems offer new opportunities to consistently, reliably, and safely operate airplanes to minimize community noise impact. Research performed under this task will address how to fly and operate airplanes quietly, and how to implement low noise procedures in today's and future air traffic management systems.

4. Community Noise Impact. The FAA and NASA will collaborate on the development and validation of the analysis tools and noise assessment methods that will define community noise impact for aircraft operations that include climbing and descending well away from the airport, not only in the immediate airport vicinity. This task also includes studies into the impact of noise and potential mitigation through a balanced approach involving source reduction, operational abatement offered by the concepts identified under Activity 3, and landside mitigation.

5. Technology Assessment. The FAA and NASA will collaborate on the assessment of technologies identified under this MOA for reducing noise that may impact residential communities around airports. The FAA will take advantage of the modeling tools developed under Activity 4 to determine system-wide noise impact reduction potential of developed technologies, along with estimated timeframes for their introductions. NASA will assess the benefits of the noise reduction concepts developed under this MOA in terms of single event noise impact metrics for the defined QAT program baseline aircraft.

6. International Cooperation. The FAA, in its role as the US representative on the Committee on Aviation Environmental Protection (CAEP) under the International Civil Aviation Organization (ICAO), will engage foreign civil aviation authorities in providing advice and information of prospects for further technological advances in source noise reduction. The effort includes the identification of trends in design margins and the timeframes for industrial application of noise reduction technologies. This activity also includes promotion of more in-depth cooperation, where appropriate under FAA and NASA policies and contractual obligations, among the various ongoing and future aviation technology research programs.

B. RESOURCES

The intent of this MOA is for the FAA and NASA to develop a resource plan that takes into account current activities such as the QAT and the ICAO CAEP Working Group 1 (WG1) work program. This plan should include funding of any cooperative or joint programs consistent with the authority and approved operating plan of each agency. The allocation of those resources will be specified within the reimbursable agreement document SOW for each approved activity. The SOW will include resources such as personnel, facilities, and funding necessary to perform each specified task.

Upon obtaining the appropriate approvals, each agency will utilize its authority to award contracts, grants, and other transactions to accomplish activities under this MOA. Such awards are to be made in accordance with applicable agency/center policies and procedures.

(1) Transfer of Funds

To the extent funds may be transferred between the FAA and NASA for services and/or goods provided on a reimbursable basis, the authority of the Economy Act, as amended, 31 U.S.C.§§ 1535 and 1536; Section 203(c) of the National Aeronautics and Space Act, as amended, 42 U.S.C. § 2473(c); or sections 226 and 227 of the FAA Reauthorization Act of 1996,49 U.S.C. § 106 (1)(6) and (m), as applicable, may be cited. The following will apply when transfer of funds for reimbursable work is required; (1) The agency providing the reimbursable services will provide a cost estimate prior to starting the work; (2) The agency requesting the reimbursable services must provide the funds in advance; (3) The agency requesting the services is responsible for the actual costs except for any costs specifically waived by the providing agency. Each task will have its own statement of work, including the costs, but the basic MOA should include these procedural requirements for all tasks that include reimbursable work. The reimbursable agreement document is an interagency agreement for the FAA and a purchase order for NASA, or other authorized method of intergovernmental funding transfer.

(2) Anti-Deficiency Act

All activities under or pursuant to this MOA are subject to the availability of appropriated funds, and no provision shall be interpreted to require obligation or provision of funds in violation of the Anti-Deficiency Act, 31 U.S.C. § 1341. This MOA is not a funding document and does not represent the obligation or transfer of funds.

C. SCHEDULE

Execution of the Activities outlined in Paragraph 4A will span the period of performance of this MOA as specified in Paragraph 8. The individual task schedules will be specified within the SOW for each approved activity and annexed to this MOA.

D. REPORTS

Technical reports generated from work performed under this MOA will be published as specified in Paragraph 7 by the organization having primary responsibility, with due acknowledgement and credit given to each organization's contribution. Research results and deliverables will be released through routine FAA and NASA channels.

E. FACILITIES

To the extent necessary to meet the responsibilities of performing these individual and joint activities, the FAA and NASA will make available any facilities necessary to conduct the research activities contained in this MOA. Appropriate facility charges will be accessed for any

facilities utilized. Certain salary and benefits and other facility charges may be waived for facility usage at NASA. These waivers will be addressed in the individual SOW and must be approved by the performing NASA Center Chief Financial Officer.

F. PROPERTY LOANS

Each agency may loan property to the other as appropriate to accomplish specified tasks. The agency borrowing property will report any loss, damage, or destruction to the lending agency within ten days. All loans will be made pursuant to the Economy Act, or other reimbursement authority, and will provide for reimbursement by the borrowing agency to the lending agency of any loss, damage, or destruction of the loaned property.

5. REPRESENTATIVES

A. TECHNICAL REPRESENTATIVES

The individuals listed below are responsible for the oversight of this MOA at their respective agencies; however, they do not have the authority to alter any of the terms of this MOA. Any requests for changes must be made in accordance with Paragraph 9A of this MOA. The central point of interagency coordination and information for this MOA is the FAA R&D Field Office at NASA Langley Research Center, Hampton, Virginia.

1. NASA: William L. Willshire, Jr., NASA Langley Research Center, MS 254, 6 East Taylor Street, Hampton, VA 23681, tel: (757) 864- 1700, fax: (757) 864-1707, w.l.willshire@larc.nasa.gov

2. FAA: Thomas L. Connor, FAA, Noise Division (AEE-100), 800 Independence Avenue, SW., Washington, DC 20591, tel: (202) 267-8933, fax: (202) 267-5594, thomas.connor@faa.gov.

B. CONTRACTUAL REPRESENTATIVES

If this MOA results in the transfer of funds between the FAA and NASA, procurement officials will be designated at the respective headquarters and/or centers. These officials will be listed in the interagency agreement for the FAA, or a purchase order for NASA, or other authorized method of intergovernmental funding transfer.

C. DISPUTES RESOLUTION

In accordance and compliance with appropriate FAA and NASA policies and procedures, all representatives will attempt to resolve any disputes arising from the implementation of this MOA. If they are unable to come to agreement on an issue, then the dispute will be referred to the FAA and NASA Program Directors, or their designated representatives, for joint resolution.

6. LIABILITY AND RISK OF LOSS

Each party agrees to assume liability for its own risks associated with agreements and activities undertaken in this MOA.

7. INTELLECTUAL PROPERTY AND DATA RIGHTS

A. DISSEMINATION OF INFORMATION

To the extent permitted by applicable law, the initial release of any information for public consumption, oral or written, concerning results or conclusions made pursuant to performance of this MOA shall require prior written approval of the Technical Representatives, FAA and NASA, named in Paragraph 5A. Both parties recognize the importance of protecting proprietary information from unauthorized disclosures. Protection of proprietary data is considered vital to the success of viable technologies, and both parties will take appropriate measures to assure such protection, consistent with applicable law.

B. PATENT AND INVENTION RIGHTS

Custody and administration of inventions made as a consequence of, or in direct relation to, the performance of activities under this MOA will remain with the respective inventing party. In the event an invention is made jointly by employees of both parties or an employee of a party's contractor, the parties will consult and agree as to the future actions toward establishment of patent protection for the invention.

8. PERIOD OF PERFORMANCE

The period of performance for this research program shall commence upon the effective date of this MOA and shall remain in effect for five (5) years unless terminated by mutual agreement as outlined in Paragraph 9B.

9. MODIFICATION/AMENDMENTS AND TERMINATION

A. MODIFICATION

This MOA may be modified only upon the mutual written consent of both agencies. Modifications must be signed by the authorized representatives of the FAA and NASA, or their designees. No oral statement by any person shall be interpreted as modifying or otherwise affecting the terms of this MOA.

B. RIGHT TO TERMINATE

Either agency may terminate this MOA upon 180 days written notice to the other agency, signed by the authorized representative of the terminating agency, or the designee of such representative. The notice shall reference the title and identifying number of this MOA, and shall contain the effective date of the termination. Upon termination, each agency will refund any portion of those funds that have been advanced by the other agency, but not yet expended in connection with work under this MOA.

10. Authority

A. NASA

This MOA is entered into by NASA pursuant to Section 203(c) of the National Aeronautics and Space Act of 1958, as amended, 42 U.S.C.§ 2473(c).

B. DOT/FAA

This MOA is entered into by FAA pursuant to Sections 226 and 227 of the FAA Reauthorization Act of 1996, 49 U.S.C. §106 (l)(6) and (m).

C. FAA/NASA EXECUTIVE COMMITTEE

This cooperative activity is established under the agreement for cooperation between the FAA and NASA signed by the Administrators on October 9, 1998, entitled "A Partnership to Achieve Goals in Aviation and Future Space Transportation."

11. APPROVALS

Department of Transportation/ Federal Aviation Administration

Louise E. Maillett

Louise E. Maillett
Acting Assistant Administrator for Policy, Planning and International Aviation

June 10, 2002

Date

National Aeronautics and Space Administration

J F Creedon

Jeremiah F. Creedon
Associate Administrator for Aerospace Technology

6/20/02

Date